



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : B05D 1/38, 3/02; B27N 9/00; B32B 7/02, B32B 27/38; C09D 5/18; C09K 21/00	A3	(11) International Publication Number: WO 96/03854 (43) International Publication Date: 15 February 1996 (15.02.96)
(21) International Application Number: PCT/US95/09761 (22) International Filing Date: 1 August 1995 (01.08.95) (30) Priority Data: 284,362 2 August 1994 (02.08.94) US (71) Applicant (for all designated States except US): BATTELLE MEMORIAL INSTITUTE [US/US]; 505 King Avenue, Columbus, OH 43201-2693 (US). (72) Inventors; and (75) Inventors/Applicants (for US only): MCGINNISS, Vincent, D. [US/US]; 1315 North State Route 3, Sunbury, OH 43074 (US). DICK, Richard, J. [US/US]; 1199 Littlejohn Drive, Columbus, OH 43227 (US). RUSSELL, Robert, E., III [US/US]; 389 Catalina Drive, Newark, OH 43055 (US). ROGERS, Stephen, D. [US/US]; 3005 Trinity Drive, Bowie, MD 20715 (US). (74) Agents: GOLDSTEIN, Steven, J.; Frost & Jacobs, 2500 PNC Center, 201 East Fifth Street, Cincinnati, OH 45202 (US) et al.		(81) Designated States: AU, CA, JP, MX, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> (88) Date of publication of the international search report: 6 June 1996 (06.06.96)
(54) Title: THERMALLY-PROTECTIVE INTUMESCENT COATING (57) Abstract An intumescent coating system and method therefor are disclosed for thermally protecting a substrate exposed to fire. The instant coating system has a first component which forms a rigid carbonific char foam having toughness, and a second component which forms an insulative carbonific char foam having about half the density of the rigid carbonific foam. The two foams may be separately applied as, respectively, an inner coating layer coated and cured on the substrate, and an outer coating layer coated and cured on the inner film layer. Alternatively, the two foams are provided as a blend to comprise a single coating layer which is coated and cured on the substrate. While one foam component protects the substrate from breakthrough and direct exposure to fire conditions, the other insulates to protect it from heating by fire conditions, thus offering flame retardancy at film thicknesses of less than 1.27 mm (50 mils).		

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US95/09761

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : Please See Extra Sheet.

US CL : 428/218,411.1,413,921; 427/373,393.3, 407.1; 252/606

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 428/218,411.1,413,447,480,921; 427/228,373,393.3, 407.1,419.1,49.7; 252/606; 106/18.11, 18.14

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 4,663,226 (VAJS ET AL) 5 May 1987, col.1, lines 9-30, 60-col.2, line 8, 32-col.3, line 20, 37-col.5, line 24; Figs.	1-21
Y	US, A, 5,004,632 (MCGARVEY ET AL) 2 April 1991	1, 3-7,9-14
Y	US, A, 4,857,364 (VON BONIN) 15 August 1989, col.1, line 31-col.2, line 68; col.9, lines 23-61; col.10, lines 27-62.	1-21
Y	US, A, 4,879,066 (CROMPTON) 7 November 1989, col.2, line 16-col.3, line 60.	15-21
A	US, A, 4,292,358 (FRYER ET AL) 29 September 1981.	1-14
A	US, A, 3,915,777 (KAPLAN) 28 October 1975.	1-14

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

A	document defining the general state of the art which is not considered to be of particular relevance	*T*	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
E	earlier document published on or after the international filing date	*X*	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
L	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Y*	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
O	document referring to an oral disclosure, use, exhibition or other means		
P	document published prior to the international filing date but later than the priority date claimed	*A*	document member of the same patent family

Date of the actual completion of the international search

05 JANUARY 1996

Date of mailing of the international search report

80 JAN 1996

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US95/09761

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 3,955,987 (SCHAAR ET AL) 11 May 1976.	1-14
A	US, A, 4,069,075 (BILLING ET AL) 17 January 1978.	1-14
A	US, A, 4,324 835 (KEEN) 13 April 1982.	15-21
A	US, A, 4,632,865 (TZUR) 30 December 1986.	1-14
A	US, A, 5,323,682 (KEENAN) 28 June 1994.	1-14
A	US, A, 4,725,457 (WARD ET AL) 16 February 1988.	15-21

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US95/09761

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.: 22
because they relate to subject matter not required to be searched by this Authority, namely:

the claim is not directed to any new and useful process, manufacture, composition of matter, or new and useful improvements thereof.
2. ☒ Claims Nos.: 22
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

the claim fails to particularly point out and distinctly claim the invention.
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

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2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐
☐

- The additional search fees were accompanied by the applicant's protest.
No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US95/09761

A. CLASSIFICATION OF SUBJECT MATTER: IPC (6):

B 05 D 1/38, 3/02; B 27 N 9/00; B 32 B 7/02, 27/38; C 09 D 5/18; C 09 K 21/00

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